Installation, Setup and Operation

INSTRUCTIONS

for

SUNNEN® CNC VERTICAL HONING MACHINE

Models: SV-500 Series

READ THE FOLLOWING INSTRUCTIONS THOROUGHLY AND CAREFULLY BEFORE UNPACKING, INSPECTING, OR INSTALLING THE SUNNEN® SV-500 SERIES CNC VERTICAL HONING MACHINE.

"SUNNEN AND THE SUNNEN LOGO ARE REGISTERED TRADEMARKS OF SUNNEN PRODUCTS COMPANY."

SUNNEN® PRODUCTS COMPANY • 7910 MANCHESTER ROAD • ST. LOUIS, MO 63143, U.S.A. • PHONE: 314-781-2100

GENERAL INFORMATION

The Sunnen® equipment has been designed and engineered for a wide variety of parts within the capacity and limitation of the equipment. With proper care and maintenance this equipment will give years of service.

READ THE FOLLOWING INSTRUCTIONS CAREFULLY AND THOROUGHLY BEFORE UNPACKING, INSPECTING, OR INSTALLING THIS EQUIPMENT.

IMPORTANT: Read any supplemental instructions BEFORE installing this equipment. These supplemental instructions give you important information to assist you with the planning and installation of your Sunnen equipment.

Sunnen Technical Service Department is available to provide telephone assistance for installation, programming, & troubleshooting of your Sunnen equipment. All support is available during normal business hours, 8:00 AM to 4:30 PM Central Time. Emergency breakdown support is available on a 24 hour / 7 day basis.

Review all literature provided with your Sunnen equipment. This literature provides valuable information for proper installation, operation, and maintenance of your equipment. Troubleshooting information can also be found within the Instructions. If you cannot find what you need, call for technical support.

Where applicable, programming information for your Sunnen equipment is also included. Most answers can be found in the literature packaged with your equipment.

Help us help you. When ordering parts, requesting information, or technical assistance about your equipment, please have the following information available:

- Have ALL MANUALS on hand. The Customer Services Representative or Technician will refer to it.
- Have Model Number and Serial Number printed on your equipment Specification Nameplate.
- Where Applicable: Have Drive model and all nameplate data. Motor type, brand, and all nameplate data.

For Troubleshooting, additional information may be required:

- Power distribution information (type - delta, wye, power factor correction; other major switching devices used, voltage fluctuations)
- Installation Wiring (separation of power & control wire; wire type/class used, distance between drive and motor, grounding).
- Use of any optional devices/equipment between the Drive & motor (output chokes, etc.).

For fast service on your orders call:

Sunnen Automotive Customer Service toll free at: 1-800-772-2878

Sunnen Industrial Customer Service toll free at: 1-800-325-3670

Customers outside the USA, contact your local authorized Sunnen Distributor.

Additional information available at: http://www.sunnen.com or e-mail: sunnen@sunnen.com

NOTE: Sunnen reserves the right to change or revise specifications and product design in connection with any feature of our products contained herein. Such changes do not entitle the buyer to corresponding changes, improvements, additions, or replacements for equipment, supplies or accessories previously sold. Information contained herein is considered to be accurate based on available information at the time of printing. Should any discrepancy of information arise, Sunnen recommends that user verify the discrepancy with Sunnen before proceeding.

ESD PREVENTION REVIEW

Let's review the basics of a sound static control system and its effective implementation. First, in the three step plan:

1. Always ground yourself when handling sensitive components or assemblies.
2. Always use a conductive or shielded container during storage or transportation. These materials create a Faraday cage which will isolate the contents from static charges.
3. Open ESD safe containers only at a static safe work station.

At the static safe work station, follow these procedures before beginning any work:

A. Put on your wrist strap or foot grounding devices.

B. Check all grounding cords to make sure they are properly connected to ground, ensuring the effective dissipation of static charges.

C. Make sure that your work surface is clean and clear of unnecessary materials, particularly common plastics.

D. Anti-static bubble wrap has been included for use at the machine when an ESD safe workstation is not available.

You are now properly grounded and ready to begin work. Following these few simple rules and using a little common sense will go a long way toward helping you and your company in the battle against the hazards of static electricity. When you are working with ESD sensitive devices, make sure you:

GROUND

ISOLATE

NEUTRALIZE

SUNNEN® LIMITED PRODUCT WARRANTY

Sunnen® Products Company and its subsidiaries (SPC) warrant that all new SPC honing machines, gaging equipment, tooling, and related equipment will be free of defects in material and/or workmanship for a period of one year from the date of original shipment from SPC.

Upon prompt notification of a defect during the one-year period, SPC will repair, replace, or refund the purchase price, with respect to parts that prove to be defective (as defined above). Any equipment or tooling which is found to be defective from improper use will be returned at the customer's cost or repaired (if possible) at customer's request. Customer shall be charged current rates for all such repair.

Prior to returning any SPC product, an authorization (RMA#) and shipping instructions must be obtained from the Customer Service Department or items sent to SPC will be returned to the customer.

Warranty Limitations and Exclusions This Warranty does not apply to the following:

- Normal maintenance items subject to wear and tear: (belts, fuses, filters, etc).
- Damages resulting from but not limited to:
  - › Shipment to the customer (for items delivered to customer or customer's agent F.O.B., Shipping Point)
  - › Incorrect installation including improper lifting, dropping and/or placement
  - › Incorrect electric power (beyond +/- 10% of rated voltage) including intermittent or random voltage spikes or drops
  - › Incorrect air supply volume and/or pressure and/or contaminated air supply
  - › Electromagnetic or radio frequency interference from surrounding equipment (EMI, RFI)
  - › Storm, lightning, flood or fire damage
  - › Failure to perform regular maintenance as outlined in SPC manuals
  - › Improper machine setup or operation causing a crash to occur
  - › Misapplication of the equipment
  - › Use of non-SPC machines, tooling, abrasive, fixturing, coolant, repair parts, or filtration
  - › Incorrect software installation and/or misuse
  - › Non-authorized customer installed electronics and/or software
  - › Customer modifications to SPC software

THE LIMITED WARRANTY DESCRIBED HEREIN IS EXPRESSLY IN LIEU OF ALL ANY OTHER WARRANTIES. SPC MAKES NO REPRESENTATION OR WARRANTY OF ANY OTHER KIND, EXPRESS OR IMPLIED, WHETHER AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER MATTER. SPC IS NOT RESPONSIBLE FOR THE IMPROPER USE OF ANY OF ITS PRODUCTS. SPC SHALL NOT BE LIABLE FOR DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES INCLUDING BUT NOT LIMITED TO: LOSS OF USE, REVENUE, OR PROFIT. SPC ASSUMES NO LIABILITY FOR PURCHASED ITEMS PRODUCED BY OTHER MANUFACTURERS WHO EXTEND SEPARATE WARRANTIES. REGARDLESS OF ANY RIGHTS AFFORDED BY LAW TO BUYER, SPC's LIABILITY, IF ANY, FOR ANY AND ALL CLAIMS FOR LOSS OR DAMAGES WITH RESPECT TO THE PRODUCTS, AND BUYER'S SOLE AND EXCLUSIVE REMEDY THEREFORE, SHALL IN ALL EVENTS BE LIMITED IN AMOUNT TO THE PURCHASE PRICE OF THAT PORTION OF THE PRODUCTS WITH RESPECT TO WHICH A VALID CLAIM IS MADE.

Shipping Damages

Except in the case of F.O.B., Buyer's destination shipments, SPC will not be liable for any settlement claims for obvious and/or concealed shipping damages. The customer bears the responsibility to unpack all shipments immediately and inspect for damage. When obvious and/or concealed damage is found, the customer must immediately notify the carrier's agent to make an inspection and file a claim. The customer should retain the shipping container and packing material.

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Any alteration or reverse engineering of the software is expressly forbidden and is in violation of this agreement.

SPC reserves the right to update the software covered by this agreement at any time without prior notice and any such updates are covered by this agreement.

SAFETY INSTRUCTIONS

READ FIRST

This machine, like any equipment, may be dangerous if used improperly. Please read all warnings and instructions before attempting to use this machine.

Always disconnect power at main enclosure before servicing machine.[1]

Always wear eye protection when operating this machine.

NEVER open or remove any machine cover or protective guard with power "ON." Always disconnect power at main enclosure before servicing this equipment.[1]

DO NOT attempt any repair or maintenance procedure beyond those described in this book. Contact your Sunnen® Field Service Engineer or Technical Services Representative for repairs not covered in these instructions.

Due to the wide variety of machine configurations, all possibilities cannot be described in these instructions. Instructions for safe use and maintenance of optional equipment ordered through Sunnen, will be provided through separate documentation and/or training provided by your Sunnen Field Service Engineer or Technical Services Representative.

DO NOT attempt to defeat any safety device on this machine or on any of the optional equipment.

If specially built automation components are added to this system, be sure that safety is not compromised. If necessary, obtain special enlarged work area safety system from Sunnen Products Co.

CE Indicates CE version ONLY.

[1] DO NOT touch electrical components until main input power has been turned off and *CHARGE* lamps are extinguished. WARNING: The capacitors are still charged and can be quite dangerous.

IMPORTANT NOTE

The temperature requirements of the Sunnen® SV-500 Series Vertical Honing Machine have been established as 35 degrees C (95 degrees F). Above this temperature, an optional cooler will be available to handle temperatures from 35º to 46º C (95º to 115º F). IT IS NOT recommended that the SV Machine be operated at temperatures above 46º C (115º F). Sunnen Products Company warrants the SV Machine for operating environments up to 35ºC (95º F). For operating environments of 35º to 46º C (95º to 115º F) the warranty only applies if the optional cooler is installed on the Machine. No warranty coverage is offered for operating environments above 46º C (115º F).

INTRODUCTION

This Instruction Manual provides information required to install, operate, and maintain Sunnen® Vertical Honing Machine.

When ordering parts for, or requesting information about your Machine, include model and serial numbers, located on Electrical Enclosure of your Machine.

In this book the CE symbol indicates steps or information that are only for CE version of this machine. The CE version is constructed to meet highest level of safety standards as required by the European Machinery Directive. Required for European market, this CE version is available for any customer. The regular version of this machine is quite safe for any operator exercising a normal degree of caution associated with machine tool use. The CE version provides an extra level of protection by minimizing risks of operator carelessness.

The SV-500 Series Vertical Honing Machine is to be used for finishing bores in small workpieces. In finishing bores, this machine can achieve any or all of following results: fast stock removal, consistent final size, a high degree of cylindrically, fine surface finish. To achieve best results and ensure safe operation, ONLY Sunnen Tools and Abrasives are to be used in the SV-500 Series Vertical Honing Machines.

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GENERAL INFORMATION & SPECIFICATIONS

Sunnen® CNC Vertical Honing Machines - SV-500 Series

Diameter Range (ID)[1]:	19 - 300 mm (.75 - 12 in.)
Workpiece Weight[1]:	900 kg (2000 lbs.)
Maximum Workpiece Length[1]:	710 mm (28 in.) / 864mm (34in.)
Stroke Travel (Z Axis):	Up to 762 mm (30 in.)
Stroke Speed (Z Axis):	1-160 spm; length dependent
Stroke (Column) Motor:	7,5 kW (10 hp); DC Servo
Thrust:	1360 kg (3000 lbs.) maximum
Spindle Speeds:	0 to 300 rpm
Spindle Motor:	15 kW (20 hp) @ 300rpm (peak)
Feed System:	Linear (Push-Pull)
Sump Pump[2]:	Centrifugal Pump
Sump Pump Motor[2]:	0,25 kW@114 LPM (.33 hp@30 GPM)
Coolant System[2]:	Optional
Coolant Requirements:	Sunnen Industrial Honing Fluids
Control System:	Inductrial PC w/Windows®
Machine Floor Space (Foot Print):	2210 W x 2056 D x 2275 H mm (87x81x89.5in.)w/o Opt. Coolant Sys.
Floor Weight (Dry):	4309 kg (9500 lbs.)
Floor Load:	512 kg/sq. meter (105 lbs./sq. ft)
Electrical Requirements:	400V/460V, 60Hz, 3Ph (CE approved)
Color:	Black / Stainless Steel
Noise Emission:	Less than 72 dB(A) continuous Less than 75 dB(A) peak Load (max. noise) condition in a typical factory environment.
Optional Equipment:	Coolant Tank w/Magnetic Separator, Paperbed Filtration, Custom Guarding, T-Slot Table, Rotary Index Table 2-32 position, Linear Shuttle Table, Air Gage Intergrated Hone Head & Post-Process Gaging w/Feedback

[1] Diameter range, length range, and workpiece weight are contingent on workpiece and application.
[2] The SV-500 does NOT come with a Coolant System. The Coolant System is an option and MUST be order separately.
[3] Work Area includes Machine Floor Space plus clearance for operator to move around machine.

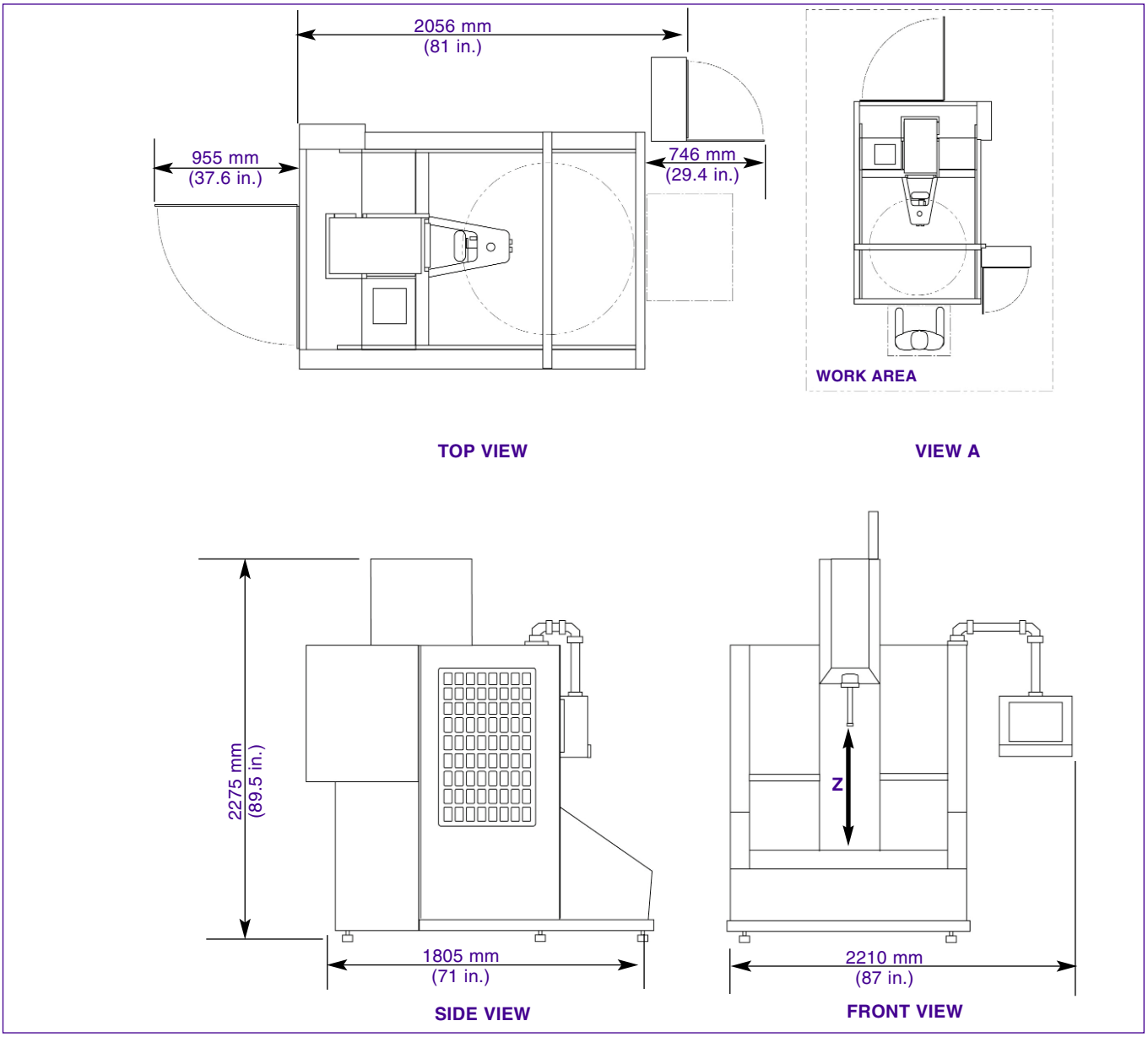


FIGURE 1-A, Floor Plan Layout (System Configuration)

SECTION 1
INSTALLATION

GENERAL

Consult this section when unpacking, inspecting, and installing Sunnen® CNC Vertical Honing Machine (see Figure 1-1). Hereafter referred to as the machine.

TOOLS & MATERIALS

The following tools and materials are required for unpacking and installing of your Machine:

Knife	Hex Wrenches
Hammer	Open End Wrenches
Crow Bar	Cleaning Solvent
Tin Snips	Screwdriver (Std)
Slip Joint Pliers	Forklift

INSTALLATION

Read the following instructions carefully and thoroughly before unpacking, inspecting and installing your Machine. All references to right and left in these instructions are, unless otherwise noted, as seen by operator as one looks at Machine or assembly being described (refer to Figure 1-1).

NOTE: When ordering parts for, or requesting information about your Machine, include Model and Serial Numbers printed on Nameplate.

FIGURE 1-1, Vertical Honing Machine

1. Move Machine to staging/unpacking area.

2. Remove shipping carton and plastic wrap. (Cut, remove and discard shipping bands.

3. Remove steel bracket that holds column from moving during shipping.

4. Remove all loose components.

5. Check all components against packing list.

6. Inspect Machine and components for dents, scratches, or damage resulting from improper handling, by carrier. If damage is evident, immediately file a claim with carrier.

CAUTION

Weight is approx. 4309 kg (9500 lb).

7. Remove Bolts securing Machine to Skid.

8. Using a forklift remove machine from skid and move to desired location and lower into place (see Figure 1-2).

NOTE: Machine should be located on a leveled concrete floor away from heavy traffic. Allow at least 1m (38in.) around enclosure to any adjacent equipment and walls. Refer to Figure 1-A, Floor Plan Layout.

9. Adjust Leveling Bolt in Four (4) feet as required. Tighten Jam Nuts to lock bolt in place (see Figure 1-3). Machine does not need to be bolted to floor but should be set on 1/2" thick steel pads.

• Place a precision machinist level on Horizontal Column Guides on right side of machine Lower Frame Assembly, and check for level left to right and front to back as shown. Adjust Leveling Bolts on Adjustable Feet as required, using a 24mm Open End Wrench (refer to Figure 1-3).

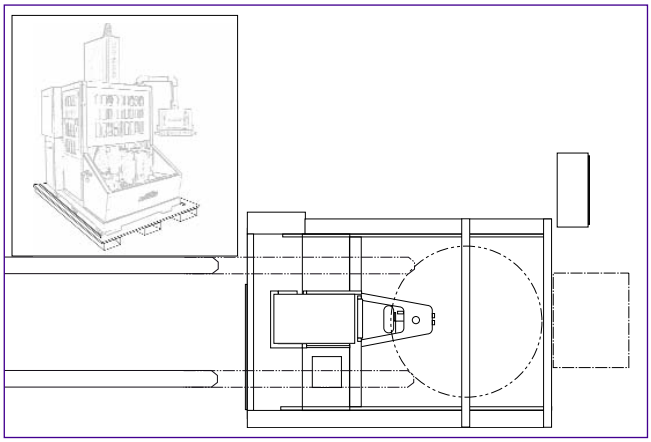


FIGURE 1-2, Fork Lift

• Repeat for left side of machine.

• Check left to right and front to back, and re-adjust as required. Tighten Jam Nuts to lock bolt in place.

• Adjust center Leveling Bolts on left and right sides of table until they just touches the floor.

• Tighten Jam Nuts on all the feet.

10. ATTENTION - The Cable Track has been disconnected from column for shipping purposes. Reattach Cable Track to top of column using bolt and washer supplied (see Figure 1-4).

11. ATTENTION - Remove Wooden Support, added to Machine to restrict movement of Column during transit.

12. Wipe all protective shipping oil and grease from Machine. (Clean rust preservative from way bars and any other bright metal surfaces.)

ELECTRICAL

All wiring is to be performed by a competent, Licensed Electrician in accordance with all local, state, and federal codes and regulations; along with any special information provided on machine nameplate or electrical specification plate (see Figure 1-5).

CAUTION

This machine was wired for 460VAC. If it is to be run at 400VAC the taps on the control transformer 1T must be changed. All wiring is to be performed by a competent, licensed electrician in accordance with all local, state and federal codes and regulations. FAILURE TO COMPLY CAN RESULT IN PERSONAL INJURY AND DAMAGE TO THE MACHINE.

WARNING

All wiring and electrical equipment service should be performed by authorized personnel ONLY.

CAUTION

Do not attempt to connect machine if supply voltage is not within acceptable limits as noted on nameplate or electrical specification plate. If supply voltage is not within these limits MACHINE WILL BE DAMAGED.

Verify supply voltage is same as voltage on Machine Nameplate or Electrical Specifications Plate.

ELECTRICAL CONNECTION

A pre-drilled hole has been provided in Electrical Enclosure for Electrical Supply Cord (not supplied). Connect Cord as follows (refer to Figure 1-5).

WARNING

Residual Voltage exists for 2-3 minutes after Master ON/OFF Switch is turned OFF. Before working inside Enclosure, wait for all fans to stop running to allow drives to discharge.

1. Unlock Door to Electrical Control Enclosure. Loosen Safety Latches on door(s) to enclosure, using a screwdriver.

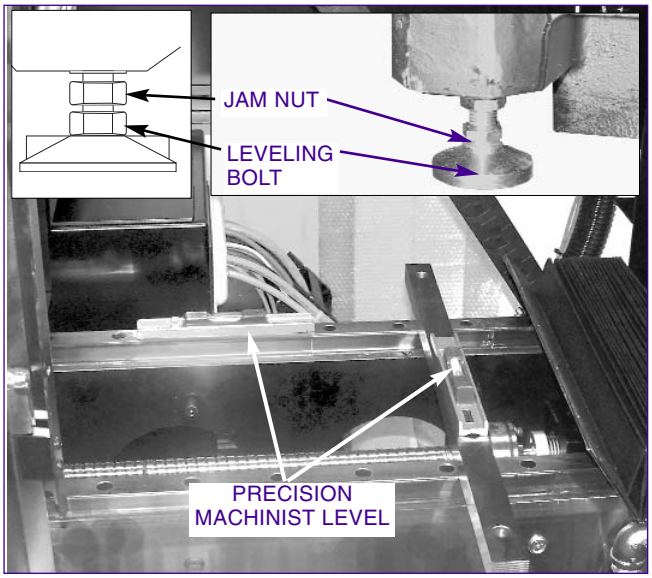


FIGURE 1-3, Leveling Bolts

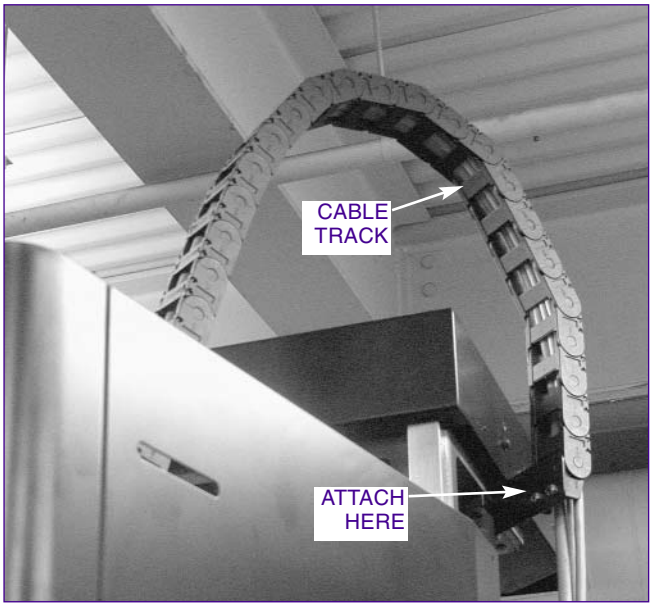


FIGURE 1-4, Cable Track

CAUTION

Door is equipped with lockable Safety Door Latch. Door should be closed and latched during operation to prevent accidental interruption of operation from doors being opened. Door Latch should be Locked-Out and Tagged during servicing to prevent machine from being powered up.

2. Turn Master ON/OFF Switch to OFF position and open Door. (Door WILL NOT open unless Master ON/OFF Switch is in OFF position.)

3. Open Door to enclosure.

WARNING

You must use the hole provided. Drilling any new holes in the electrical enclosure may void the warranty.

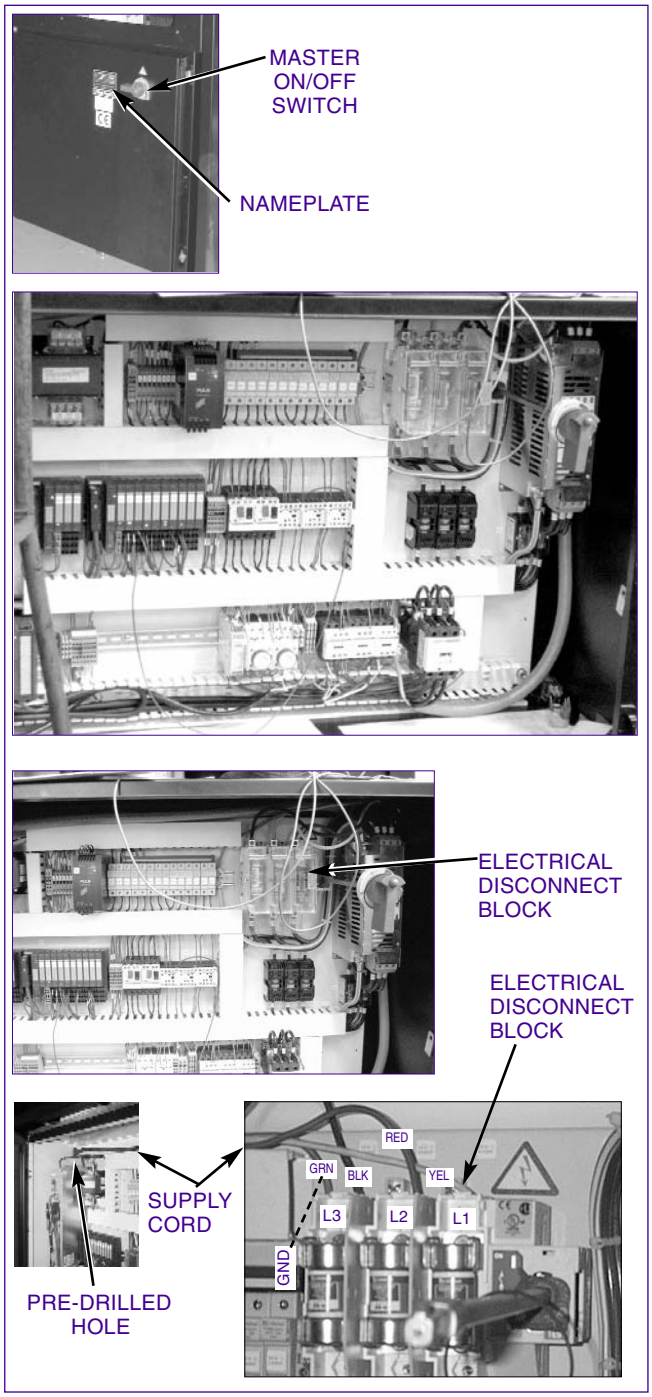


FIGURE 1-5, Electrical Connection

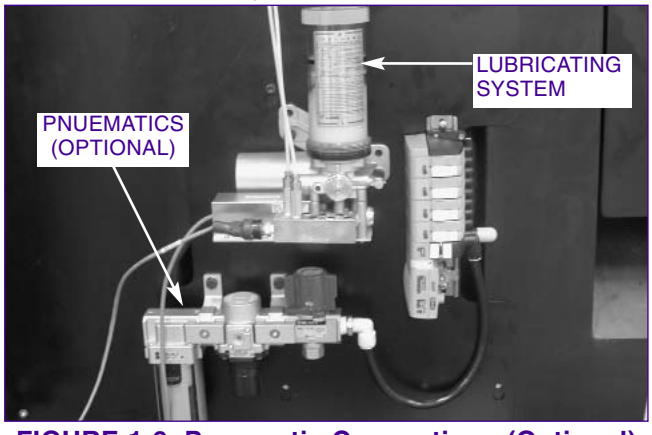


FIGURE 1-6, Pneumatic Connections (Optional)

4. Remove hole plug located on top,left side of the enclosure. Then install an oil tight fitting.

5. Insert Electrical Supply Cord through Oil Tight Fitting and route to Electrical Disconnect Block.

6. Strip 254 mm (10 in) off cable's outer jacket.

7. Strip 6 mm (1/4 in) of insulation off each wire.

8. Connect Green Wire (GRN) to Terminal PE on Electrical Disconnect Switch (Earth Ground).

9. Connect other three wires to Disconnect Block (1DISC) as noted on Block (L1, L2, L3).

10. Route and secure Cord inside of Enclosure.

11. Tighten Oil Tight Fitting.

12. Close and secure/lock Door to Enclosure.

13. Route and connect Electrical Supply Cord to factory main power source.

14. Turn ON Master ON/OFF Switch.

PNEUMATICS (Optional)

Connect pneumatic line (airline) as follows (see Figure 1-6):

NOTE: The Factory Air Supply Line is not supplied. A minimum of 0,55 MPa (80 psi) clean, dry compressed air is required for proper operation.

1. Install Quick-Disconnect (not supplied) in airline port on Airline Filter Regulator.

2. CONNECT 1/2 in. (13 mm) factory air supply line (not supplied) to Quick-Disconnect.

3. Airline Filter Regulator Valve: This valve is preset at the factory to 0,55 MPa (40 psi).

LUBRICATING SYSTEM

The machine is equipped with an automatic grease lubricating system.

Grease Reservoir is filled at the factory with Sunnen 90123 (Kluberplex #BEM34-132 or its equivalent) (refer to Figure 1-6). System is equipped with a Pressure Switch, which flashes a warning on the operator display screen when the level/pressure drops below minimum requirement.

HYDRAULIC CONNECTION (Optional)

Position Hydraulic Unit and connect hydraulic lines. (see Figure 1-7 and Hydraulic Diagram.)

1. Connect numbered lines as shown between numbered fittings on side of Machine Base and End of Unit.

2. Unit comes filled with DTE25 hydraulic fluid filtered to 10 microns from factory.

COOLANT SYSTEM (Optional)

The machine comes with a Sump Pump and a base Reservoir. Because of the numerous application possibilities the machine is not supplied with a coolant system, optional Coolant Systems are available.

Placement and system requirements will vary with coolant system used. Sunnen provides several optional coolant systems (see Figure 1-8). Check with your local Sunnen Field Service Engineer or Sunnen Products Company Technical Services for available systems or before installing another manufacturer's system.

IMPORTANT

Operating Instructions and Repair Parts Catalogs for the optional Coolant Systems are supplied by the systems manufacturer.

Fill Coolant Reservoir with either Sunnen Industrial Honing Oil or Sunnen Water-Based Coolant. Refer to Section 4.

COOLANT SYSTEM CONNECTION

The machine comes with a Sump Pump and a small Reservoir. Intake and Outlet Hose Barbs are provided for connecting optional Coolant System (see Figure 1-8):

CAUTION

Supply coolant pressure should not exceed 20 psi (0,14 MPa).

MAGNETIC SEPARATOR (Optional)

Like the Coolant System, the machine is not supplied with a magnetic separator (see Figure 1-8). If your application produces large amounts of metal residue, it is recommended that you employ either or both a magnetic separator and filter system. Check with your local Sunnen Field Service Engineer or Sunnen Products Company Technical Services for available options or before installing another manufacturer's system.

SPECIAL FIXTURE (Optional)

Because of the numerous applications possibilities the machine is not supplied with any fixturing, optional fixtures are available (see Figure 1-9). Check with your local Sunnen Field Service Engineer or Sunnen Products Company Technical Services.

OPERATIONAL CHECK

Read Sections 1, 2 and 3 thoroughly and carefully before performing the Operational Check.

NOTE: Power up and start machine to check for proper operation. When machine is powered up it should open the “Sunnen” software.

1. Release E-STOP and press POWER ON Button.
2. Once machine is through initializing, press Green Cycle Start Button.
3. Then press “F1 Main Menu,” then press “F1 Setup Menu.”
4. Then press “F2 New Setup,”and follow directions on display screen.
5. Once a setup is install; at Main Menu press “F2 Run Menu.”
6. In run settings you can toggle the coolants lines to check the rotation of the Sump Pump Motor.

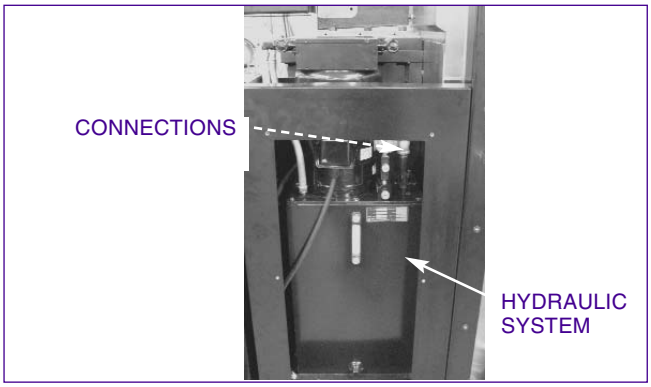


FIGURE 1-7, Hydraulic Connections (Optional)

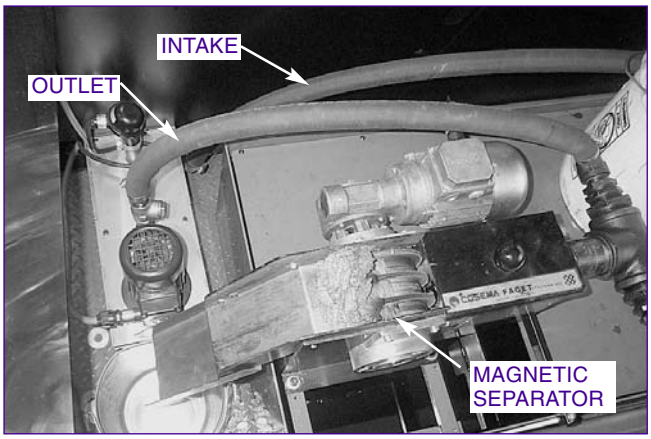


FIGURE 1-8, Coolant System (Optional)

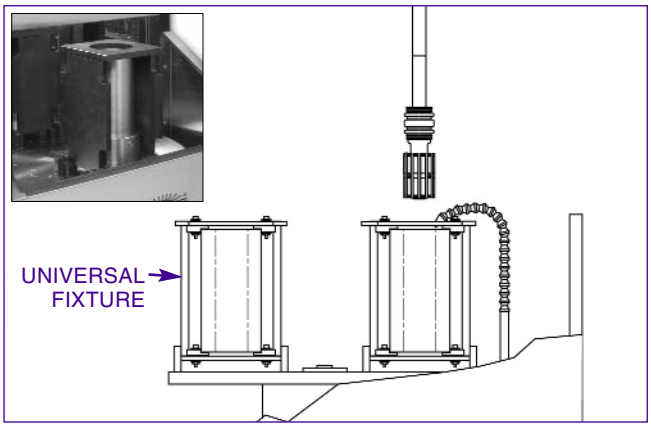


FIGURE 1-9, Universal Fixture Optional)

(Rotation of Shaft should be as shown on Motor Cover.)

7. If rotation is incorrect, turn OFF power to Machine and reverse any two wires (red, white, or black) of electrical supply cord, where they connect to Disconnect Block.
8. Operate Machine and check rotation of optional equipment according to Installation Instruction package with optional equipment.
9. Set up and test all machine functions (refer to Section 3).
10. After unpacking and installing Machine, clean and lubricate (refer to Section: 4, Routine Maintenance).

SECTION 2
PREPARING FOR OPERATION

GENERAL

Consult this section when preparing the Machine for operation.

Read Sections 1, 2 and 3 thoroughly and carefully before Operating this Machine.

NOTE: Power up and start machine to check for proper operation. When machine is powered up it should open the "Sunnen" software.

MAJOR COMPONENTS

Consult the following figure for location of major components on your machine, (see Figure 2-1).

1a. The *Machine Base* is equipped with

1b. *Leveling Bolts* for stabilizing Machine and

1c. *Stainless Steel Guards*.

1d. *Stainless Steel Access Doors*. Located on both sides of Machine.

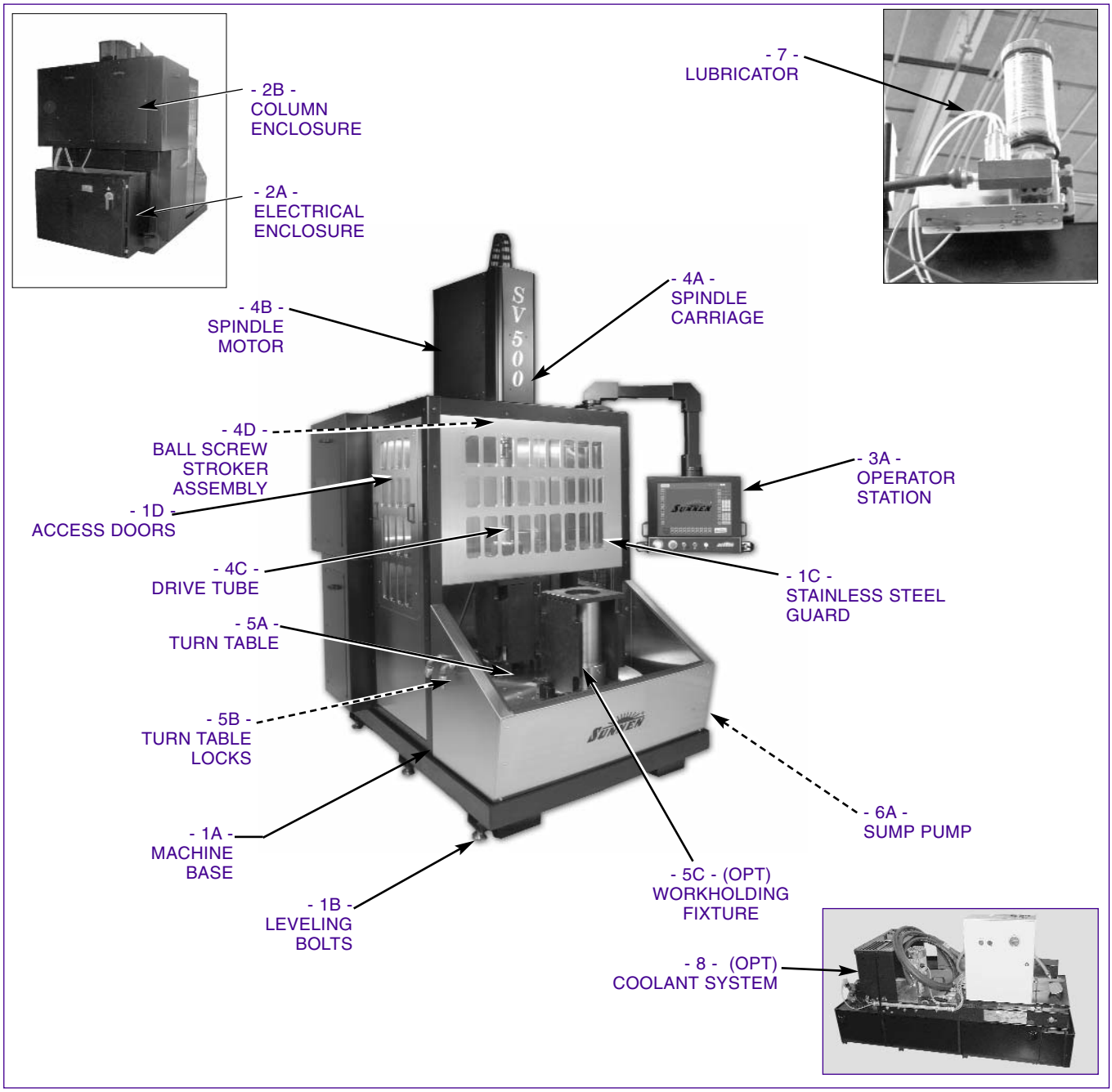

- 2B - COLUMN ENCLOSURE
- 2A - ELECTRICAL ENCLOSURE
- 7 - LUBRICATOR
- 4B - SPINDLE MOTOR
- 4A - SPINDLE CARRIAGE
- 4D - BALL SCREW STROKER ASSEMBLY
- 1D - ACCESS DOORS
- 3A - OPERATOR STATION
- 4C - DRIVE TUBE
- 1C - STAINLESS STEEL GUARD
- 5A - TURN TABLE
- 5B - TURN TABLE LOCKS
- 6A - SUMP PUMP
- 1A - MACHINE BASE
- 1B - LEVELING BOLTS
- 5C - (OPT) WORKHOLDING FIXTURE
- 8 - (OPT) COOLANT SYSTEM
SV 500

FIGURE 2-1, SV-500 Vertical Honing Machine

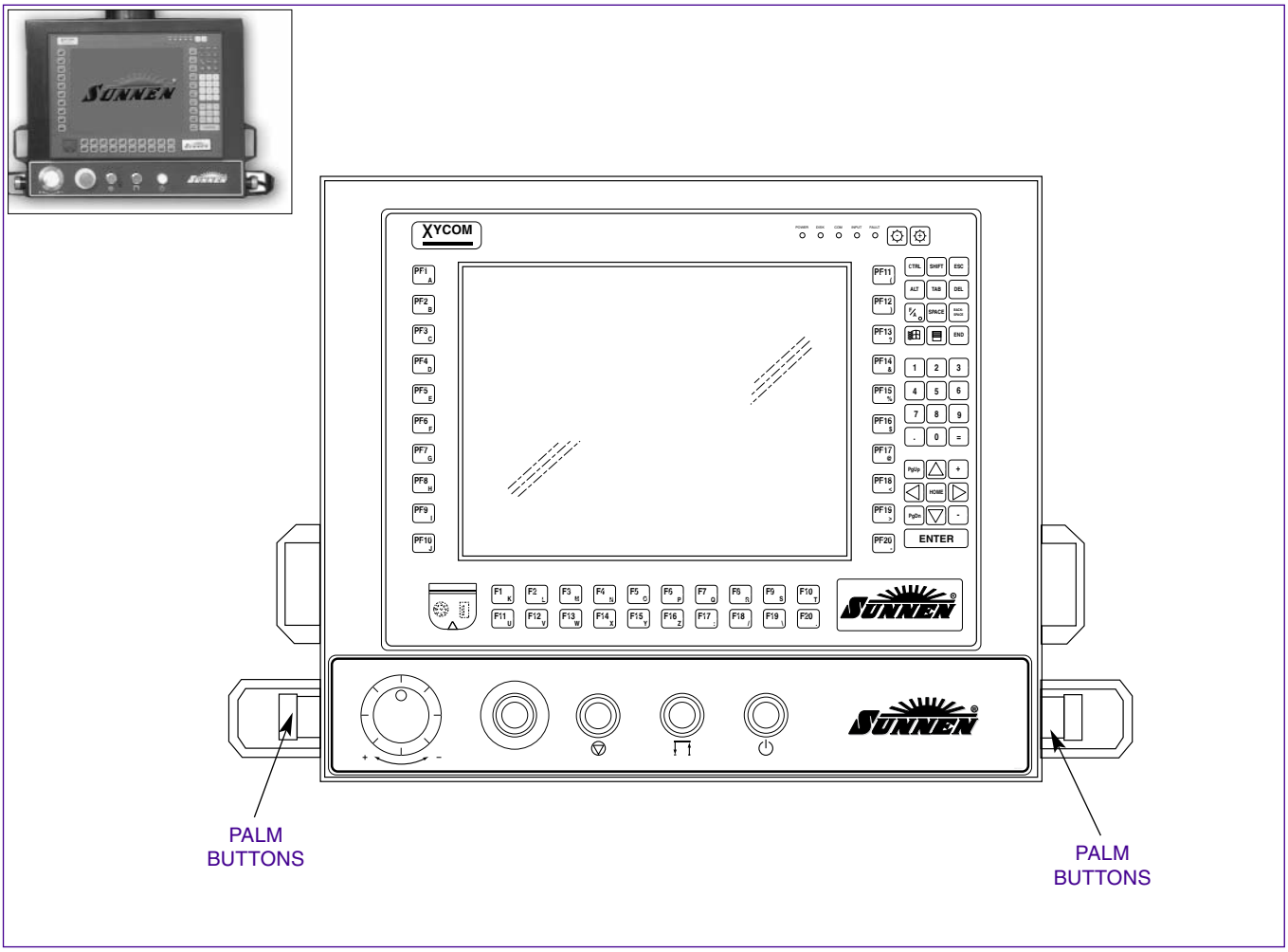


FIGURE 2-2, Operator Control Panel

TABLE 2-1, Operator Controls

SYMBOL	DESCRIPTION	FUNCTION
	E-STOP (Pushbutton, Red)	Shuts-OFF all power to the machine functions. Button must release, before Power ON button can be pushed.
	STROKER/TOOL POSITIONING (Dial)	Select either Tool Position or Tool Feed Mode on Operator Touch Screen. Tool Position Mode - Dial can be used to position Tool vertically in bore (up or down). Tool Feed Mode - Dial can be used to expand or retract stones in bore.
	POWER ON (Pushbutton, White)	Turns ON control power to the machine. After E-Stop Button is pushed; Power ON button must be pushed once to reset E-Stop Relay and again to turn ON Control Power.
	CYCLE STOP (Pushbutton, Red)	Stops honing cycle. All counters hold their count and cycle can be resumed at place where cycle was interrupted.
	DWELL (Selector Switch)	Switch is used to make stroker dwell while machine is honing. (NOTE: Under Run screen, Run Settings, Control Tab, Column A Bore Profile - there are 5 marks in middle of screen that represent five locations in bore. Using up and down ARROW keys, you can move this marker to place where you would like to dwell. When you press dwell button, stroker will dwell in location that you selected with arrow keys for 2 seconds.) For continuous dwell, hold Dwell Button in for desired length of time.
	“F” KEYS	These keys are used for a variety of functions, as indicated across the bottom of the display screen.
	KEYPAD	Numeric keypad is used to enter information into the display screen.

2a. *Electrical Enclosure*. Located on rear of Machine.
2b. *Column Enclosure*. Located on rear of column.
3a. The *Operator Station* houses all electronic hardware and software for hone control. It is also main operator interface with machine.
4a. The *Spindle Carriage* is mounted on
4b. The *Spindle Motor* which by way of a belt, drives
4c. the *Drive Tube* which imparts stroking and rotational motion from spindle to honing tool. Houses feed rod.
4d. A *Ball Screw Stroker Assembly* located inside of Column provides stroking power to Spindle Carriage.
5a. *Turn Table* (opt). Located in Base of Machine.
5b. *Turn Table Lock.* Located on rear of Rotary Table.
5c. Workholding Fixture (opt)
6a. The *Sump Pump* pumps coolant from the machine base reservoir.
6b. A *Coolant Interface* allows an optional coolant system to be attached to the machine.
7. An automatic *Lubricator* provides grease to the major components of the machine.
8. A *Coolant System* (opt) can be added to ensure debris is removed from coolant.

OPERATOR CONTROLS

For the location and function of the operator controls refer to Figure 2-2 and Table 2-1.

SAFETY SYMBOLS

For a description of safety symbols used on this machine, refer to Table 2-2.

WORKHOLDING FIXTURE

Install and align Workholding Fixtures according to instructions packaged with fixtures supplied for your particular application.

NOTE: Fixtures used on these machines are custom made for each job. Follow installation and alignment procedures packaged with your fixture.

HONING TOOL

All tooling used on these machines are custom made for each job. Follow installation and alignment procedures packaged with your tooling.

TABLE 2-2, Safety Symbols

SYMBOL	DESCRIPTION	FUNCTION
	Warning Label	Warns that an *electrical hazard* exists.
	Label	Designates this machine is *"CE" compliance*.
	Warning Label	Warns that no drilling is allowed. Drilling any new holes may void warranty.
	Warning Strip	Warns that a *physical hazard exits*, and that proper precautions should be taken.
	Caution Label Moving Parts	Warns that a finger hazard exists. Do not touch while stroker is operating.
	Warning Label (Light)	Warns that power must be OFF when belt guard is opened, to prevent injury.
	Warning Label (Safety Glasses)	Warns that safety glasses should be worn at all times when operating this machine.
	Warning Label	General Warning.

NOTES

SECTION 3
SETUP & OPERATION

GENERAL

This section gives step-by-step setup and operating procedures for Sunnen® Vertical Honing Machine.

SAFETY PRECAUTIONS

The following precautions should be observed to ensure maximum safety while working on or around your Machine.

• Wear proper Safety Items (such as safety glasses and other personal safety equipment as necessary or required).

• DO NOT wear loose fitting clothes or jewelry while working on or around Machine.

• Do not wear cotton or heavy gloves while operating this equipment!

• Keep area around Machine free of paper, oil, water and other debris at all times.

• Keep Machine and area around machine cleaned of excessive lubricant and lubricant spills.

• Keep tools and other foreign objects clear of Machine while in operation.

• Keep tools clean and in their proper storage compartments to maintain them in proper working condition and to prolong tool life.

• Inspect Tools before using. Check for cracks, burrs or bent parts that might effect operation.

• DO NOT force tools when operating. Tools will do a better and safer job when operated at the rate for which they were designed.

• Turn OFF electrical power when performing service on your machine, which does not require power.

• Disconnect Machine from main power supply and allow drives to drain before any work is performed inside of Electrical Enclosure.

• Ensure all Guards are in place and are in proper working order.

• DO NOT override safety switches or lockouts. Where interlocking systems rely on special actuators or keys, DO NOT keep spare/master actuators or keys on, around or near machine.

• Use proper lifting procedures when loading and unloading the Machine.

• Keep all non-essential persons clear of work area. Visitors, especially children, should not be permitted near the work area.

• DO NOT use machine for other than its intended use. Using these Machines for other purposes could result in damage to machine and loss of warranty.

• Be sure to work in a well lit area to avoid dangerous unseen conditions which may exist otherwise.

• Use ONLY factory authorized or recommended parts or replacement accessories. Using parts or accessories other than those approved by Sunnen could result in damage to machine and loss of warranty.

• Electrostatic discharge can damage the circuitry of the electronic components used in this Machine. Use proper electrostatic controls when working with or around electronic components. Ground Machine and use wrist strap to reduce the chances of static discharge.

• Residual Voltage exists for 2-3 minutes after Master ON/OFF Switch is turned OFF. Before working inside Enclosure, wait for all fans to stop running to allow drives to drain.

SETUP - INITIAL

To set up your machine for operation select "SETUP" from main menu. The machine's operating system software will walk you through the setup procedure step by step on the display screen. Follow all instructions carefully.

Special Topics

Controls: See Section 2, Operator Controls

Select & install Tool: See Section 2

Tool Runout: See Section 2

Table Setup: See separate instructions package with table

Fixture Setup: See separate instructions package with fixtures

Tool & Fixture Alignment: See separate instructions package with fixtures

In preparation for going through the setup sequence, the following preliminary steps can be helpful:

• Install and align any fixturing.

SETUP - INDEXING TABLE

Some Machines are equipped with a Rotary Indexing Table.

On top of the table is a round Tooling Plate. This plate is the mounting surface for the workpiece holding fixtures. If your fixtures were purchased as part of a complete Honing System, it is likely that the tooling plate was machined specially to mount the unique fixtures for your application. If you are making your own fixtures, you will probably have to machine the tooling plate to accept the fixtures you provide.

If your Sunnen fixtures arrive assembled to the tooling plate, then they have also been accurately aligned to the spindles for best honing performance. No other alignment should be necessary, but be sure to read any special instructions that come with your unique fixtures. If you are providing the fixtures or if they are taken off the tooling plate for any reason, they must be aligned to the spindles when they are reinstalled.

The tooling plate is bolted and pinned to the rotary indexing table. The roll pin provides precise repeatability of location if the tooling plate is ever removed. If you will be running more than one application on the same machine, and if those applications use different fixtures, it is recommended that each set of fixtures be assembled permanently to a tooling plate. In that way, the plate can be changed as the setup is changed and you can avoid the time consuming fixture to spindle alignment process.

The rotary indexing table can be made to index only through simultaneously touching Palm Buttons on f the machine. The control program will only allow this indexing motion at points in the Setup or in Diagnostics Modes where it is safe and pertinent to the instructions
displayed on the operator control console screen.

CAUTION

Never attempt to activate the Palm Buttons without first reading the display screen. These buttons perform different functions at different stages of the setup.

At some points during the setup and operation, the indexing table will only move one station at a time (or two at a time, if you are setup for double indexing). At other points during setup, the table may continue to move until the required position is reached.

SETUP - FIXTURE INSTALLATION

This procedure is provided as an overview to align fixture base with spindle. For detailed instructions; refer to instructions packaged with your fixture. To initially align Spindle and Fixture, proceed as follows:

1. Install Fixture bases at each station on table. Roughly align fixtures with hole in table and secure with mounting bolts. Snug, DO NOT tighten bolts at this time.

2. On spindle column mount a dial indicator.

3. Close all Guards.

4. Turn ON power at Master ON/OFF Switch, located on Electrical Enclosure.

5. Release Emergency STOP Button on Operator Control Console.

6. Press POWER-ON Button.

7. Press Palm Buttons to HOME the machine.

8. Go to Main Menu. System Settings and click on Indexing Settings Tab.

9. Press Index Positions and select number of positions (fixture) and press OK.

10. Go to Diagnostics, Machine and click on Index Table Tab.

11. Verify that tooling is out of way of fixtures.

12. Press and hold Palm Buttons to position fixture #1 under spindle.

13. Open Guards.

14. Position indicator so it can sweep a hole or other cylindrical surface on your fixture.

15. Turn the spindle by hand (with Power OFF) and read the indicator. Adjust fixture location until precise alignment is achieved. The allowable amount of misalignment depends on your application and the type of fixturing used.

16. Then, tighten mounting bolts.

NOTE: An alternate method is to mount a special close fitting alignment bar in the spindle, adjust its runout to nearly zero, and then use this bar to locate fixture on tooling plate.

17. When first fixture is aligned, advance table to next fixture and align next fixture.

18. Repeat with each fixture in turn, until all fixture bases are aligned.

19. Route and attach airlines to fixtures as needed.

20. Attach and position coolant lines at column.

SETUP - TOOL INSTALLATION

To set up your machine for operation select “SETUP” from main menu. The machine’s control software will walk you through the setup procedure step by step on the display screen. Follow all instructions carefully. If additional information is needed at any time during set up, refer to the related setup overview, which follows.

SETUP & OPERATION

Consult the following procedure when setting up your machine for operation. (Machine's control software will walk you through the setup procedure step-by-step on the view screen. Follow all instructions carefully.)

1.Release E-stop by turning clockwise.

2. Press Power ON button.

3. The software will start in the last screen displayed prior to turning off the machine. Go to Setup Menu.

4. Then press F2, New Setup.

5. Follow direction on display screen for entering a new setup:

• Key in desired value using key pad - Press OK to accept.

START DIAMETER:

• Key in desired value using key pad - Press OK to accept.

FINAL DIAMETER:

• Key in desired value using key pad - Press OK to accept.

BORE LENGTH:

• Select Material - Press OK to accept.

MATERIAL:

• Select Hardness - Press OK to accept.

HARDNESS:

6. If an Index Table is installed, you will neeed to set this up as well as identify the part status at each fixture.

7. Press NEXT to continue to next screen.

8. If airlines are part of the machine, you will be able to setup the state of the airlines at different table locations.

9. Press NEXT to continue to next screen.

10. If fixture interlocks are installed, you will be able to set their functions here.

11. Press NEXT to continue to next screen.

12. Press NEXT and continue to follow direction on display screen:

• Select Adapter - This will display your tool adapter options.

• Select Tool Family –This will display your tool selection options.

• Select Tool.

13. Press NEXT and continue to follow direction on display screen:

• Under Honing Options click in the boxes to active Pre & Post Hone Spindle Rotation. This will active grayed out buttons to the left.

• These Honing Parameter are calculated based on pre-programmed information. Do Not change these settings at this time.

NOTE: To Change: Click on parameter you wish to change, key in value, and press OK.

14. Press NEXT and continue to follow direction on display screen:

• Under Feed Options clicking in the box to activate Rapid Until Load will gray out Amount Before Start button to the left and activate Rapid Until Load Button.

• Under Feed Options clicking in the box to activate Auto Bore Detection will gray out Auto Bore Detection Force button to the left and activate Auto Bore Detection Button.

• Click in Auto Bore Detection to activate.

• These Pre-Honing Feed Parameter are calculated based on pre-programmed information. Do Not change these settings at this time.

15. Press NEXT and continue to follow direction on display screen:

• Under Feed Options click in boxes for Sizing and Sparkout. This will active the related buttons to the left and gray out Amount Before Start button.

• Leave Crosshatch Options alone at this time.

• These Post-Honing Feed Parameter are calculated based on pre-programmed information. Do Not change these settings at this time.

16. Press NEXT and continue to follow direction on display screen:

17. Install Indicator on Column A.

18. Pressing NEXT will take you to Column A Station Alignment Screen. Follow directions on display screen for aligning fixture:

• Place a workpiece in station #1.

• Verify tool is out of the way of the indicator.

• Use Palm Buttons to move workpiece to Column A.

19. Press NEXT and select Install New Tool and adapter.

20. Press NEXT and follow direction on display screen for installing tool.

NOTE: Refer to instructions for Tool Installation.

21. Once Tool is installed, remove Indicator; press NEXT and then press YES.

22. Set tool SNUG diameter by moving tool around in bore, while using handwheel, expand tool (CW) or retract tool (CCW), until tool feels snug in bore.

23. Press TEACH to set Snug Diameter. Box to right will turn green and display “the snug size is set.”

24. Press NEXT and continue the follow direction on display screen for setting stroke.

25. Press NEXT when stroke is set and follow directions on display screen for setting load position.

26. Press FINISH when stroke is set.

NOTE: On multi-spindle (columns) machines, repeat steps 13-22 for the remaining columns following the directions on the screen.

27. Press Yes to save setup.

28. Select location to save file. Name the File. Then Press Save.

29. Press F1 to return to Main Menu.

30. Press F2 to access Run Menu.

31. Install workpiece in fixture.

32. Press F2, Run Settings.

33. Click on Machine Tab.

34. Toggle ON Coolant (Green).

35. Under Cycle Mode click Single.

36. Press APPLY and then press OK.

37. Close all Guards.

38. Press CYCLE START button and run a honing cycle.

39. Open Guards.

40. Remove and check (gage) workpiece(s).

• To edit: Press F4 Edit Setup. Then press F4 to edit Part Specifications or F5 to edit Column Setup (Machine).

4. Press OK when finished.

42. Press F1 to return to Main Menu.

43. Press F2 to return to Run Menu.

44. Load parts.

45. Continue Honing.

SAFE SHUTDOWN (Turning Machine Off)

To turn OFF the Machine properly, ***DO NOT just turn off the disconnect switch.*** Please follow the following steps:

1. Using the Mouse, left click on the ☒ that is located in the upper right corner of the screen.

2. This will display the exit password dialog box. Enter “shutdown” (all lower case) and then click on he OK button.

3. After a few moments, a dialog box will come up on the screen saying that it is safe to turn off the computer. At this time, you can turn off the disconnect switch.

SECTION 4
ROUTINE MAINTENANCE

GENERAL

The following procedures are given as guides only and are not to be construed as absolute or invariable. Each machine must be maintained individually according to its particular requirements.

Read Sections 1, 2 and 3 thoroughly and carefully before Operating this Machine.

WARNING

ALWAYS have power OFF when doors are open or performing service not requiring power.

CLEANING

Daily, after use, wipe exterior of the Machine with a clean, dry cloth to remove any coolant, dust and grime. Empty Pail (Magnetic Separator) as required.

Monthly, wipe with a clean dry cloth. Then clean the exterior of Machine with warm water and a mild detergent or mild industrial solvent. Rinse thoroughly with clean hot water and wipe dry. Lightly lubricate following lubrication instructions.

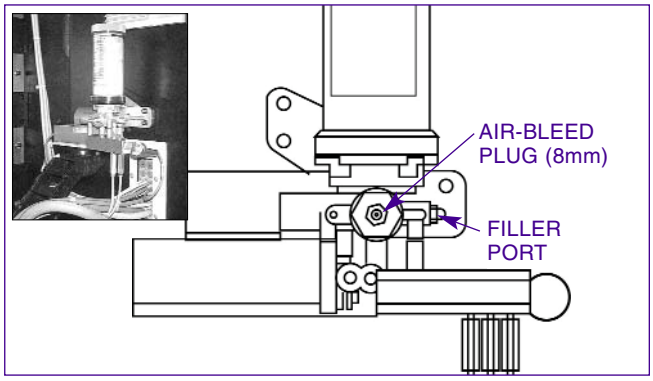


FIGURE 4-1, Grease Lubricating System

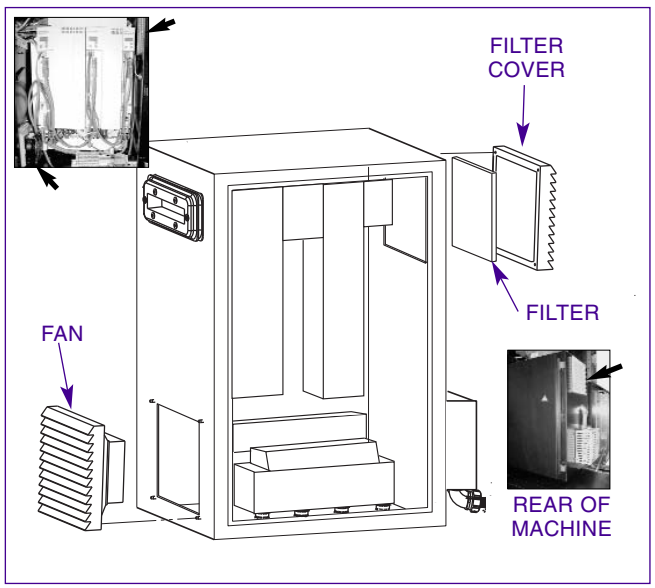


FIGURE 4-2, Air Filter Element

LUBRICATION

Inspect Grease Lines and Fittings monthly for leaks or damaged parts. Replace parts as required.

CAUTION

ALWAYS fill grease canister using filling port. Ensure no air is inside grease canister.

Grease Lubricating System

Fill Grease Reservoir with Sunnen 90123 (Kluberplex #BEM34-132 or its equivalent) *(see Figure 4-1)*.

Fill grease reservoir through grease fitting with grease gun equipped with air relief valve. It is important to the operation of the grease pump that no air is in the grease reservoir. System is equipped with a Pressure Switch, which flashes a warning on the operator display screen when the level/pressure drops below minimum requirement. To bleed system proceed as follows:

1. Turn ON machine and operate Lubrication Pump.
2. Loosen the air-bleed plug by one turn in the counterclockwise direction, using an 8mm wrench.
3. Air and grease will now emerge from tip of plug.
4. When discharge of grease becomes a continuous flow, tighten plug and stop pump, by turning clockwise.
6. Start pump and confirm that there is no leakage of grease from the air-bleed plug.

ROUTINE MAINTENANCE SCHEDULE

The following procedures and suggested maintenance periods are given as guides only, and are not to be construed as absolute or invariable. Local conditions must always be considered. Each machine must be maintained individually, according to its particular requirements.

Daily:

• If using Coolant System, check coolant level (Gage on front of Coolant System), and add coolant as necessary.

CAUTION

DO NOT overfill system.

• If using Sunnen Coolant Concentrate, check concentration and add water or concentrate as necessary.

Every 1000 Hours:

• Remove the lthe sheet metal covers that are attached to the carriage.

• Verify the operation of the lubrication system as follows: Remove/raise way covers on top of carriage to get to points where grease lines enter ball screw and spindle. Disconnect grease lines at these locations. Under Diagnostics section of software, set lube system to cycle 50 times. Verify that grease is coming out of grease lines. (There may be some delay in grease coming out of lines. This is normal.) If grease is not coming out of ines, then refer to Machine Operation Troubleshooting section for corrective action.

• Inspect the ball screw grooves for pitting or wear. Any sign of this, if it occurs in a region where the machine strokes during the honing cycle, indicates a failure is imminent, and replacement should be planned for the near future.

• Check the tension of the spindle belt. Tension used belt until 140 N is applied midspin results in a 5mm deflection. Tension New belt until 175 N is applied midspin results in a 5mm deflection.

CAUTION

Belt can be tensioned with the aid of screw placed in the assembly. This screw is only to assist in belt tensioning. Care must be taken that belt is not over-tightened by attempting to tighten this screw.

Every 10,000 km of Carriage Travel:

NOTE: The control system records cumulative carriage travel. If your application runs at recommended stroker speeds, 10,000 km of travel will be reached after approximately 7000 hours of run time.

• Re-lubricate the carriage runner blocks using Mobil SHC 639 oil. The ends of the runner block assemblies have a small set screw that can be removed for the insertion of oil. The opening is small so a small hose or needle will be needed to squirt oil into the runner block hole. Each runner block will need approximately 2.2 ml. It will be normal for some of this oil to run out of the runner blocks shortly after re-lubrication, but much of it will be retained for long-term lubrication.

Other Service:

The linear runners blocks are prepacked for a standard linear displacement of 100,000 km.

The operator station will indicate if the limit is close to being reached.

The stroker carriage can be lubed with Sunnen 90123 (Kluberplex #BEM34-132 or its equivalent) at this time.

FILTER ELEMENT REPLACEMENT

Periodically check and clean Filter Element on the side of the Electrical Enclosure, replaced as required. To clean or replace the Filter Element proceed as follows *(see Figure 4-2)*.

1. Turn OFF all power to Machine at Master ON/OFF Switch.
2. Remove Access Panel on rear of machine, by removing six (6) button socket head capsrcews.
3. Snap Filter Cover off Filter.
4. Remove Filter Element.
5. Clean Filter with warm water and a mild detergent or mild industrial solvent.
6. Rinse thoroughly with clean hot water and allow to dry.
7. Reinstall Filter Element.

NOTE: Replacement Elements and parts are available through the Sunnen or your local supplier.

8. Snap Filter Cover into place over Filter Element.
9. Reinstall Access Panel.
10. Turn ON power to the machine.

SUMP TANK CLEANING

Periodically check and clean Sump Tank. Sump Tank should be cleaned when there is a noticeable drop in coolant pressure.

1. Turn OFF all power at Master ON/OFF Switch.
2. Remove Drain Cover in right side of machine base, by removing one (1) button socket head capsrcews.
3. Attach hose to hose fitting on left inside of machine base and turn valve ON.
4. Turn ON power to the machine and operate Pump.
5. While Pump is operating use hose to spray into open drain to stir up any slug in drain and reservoir.

NOTE: If build up is light this will stir up the slug and allow the pump to carry it out of the reservoir.

6. Turn OFF power.
7. Turn OFF valve and disconnect hose.
8. Replace Drain Cover

PNEUMATIC LINES CHECK

Inspect Pneumatic Lines and Fittings monthly for leaks or damaged parts. Replace parts as required.

Filter Element Replacement

The Filter Element in the Airline Regulator should be cleaned or replaced when there is a noticeable drop in air pressure. To clean or replace the Filter Element proceed as follows *(see Figure 4-3)*.

1. Turn OFF power to Machine at Master ON/OFF Switch, Electrical Enclosure.

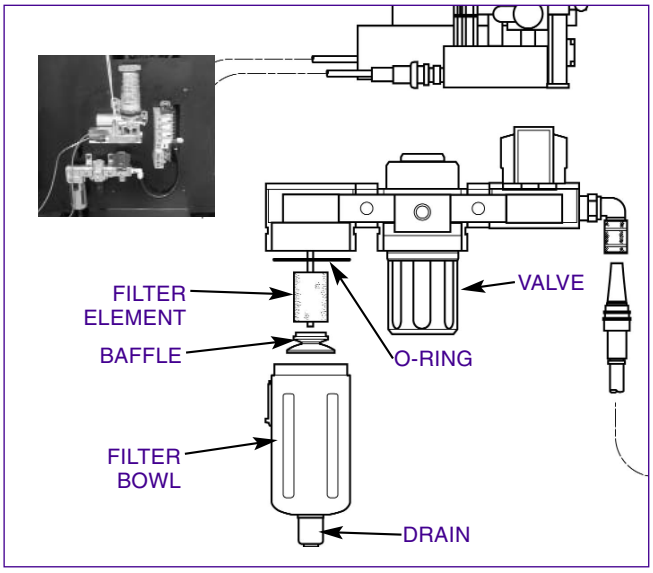


FIGURE 4-3, Pneumatic Line Check

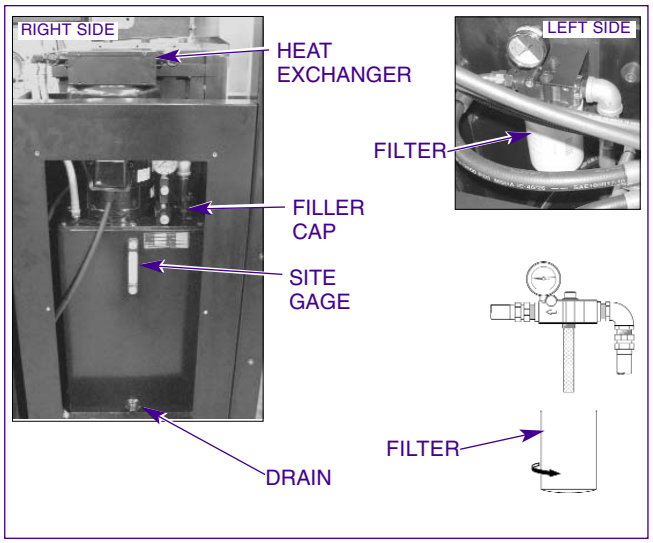


FIGURE 4-5, Hydraulic Reservoir

2. Turn Red Safety Valve to OFF and disconnect In-Coming Factory airline at Quick-Disconnect.

3. Bleed any trapped air from filter.

4. Remove Bowl Assembly from Unit, by holding down on release Button and rotating Bowl. Lay Bowl aside for reinstallation.

CAUTION

Use care in disassembling to prevent O-Ring from being damaged.

5. Unscrew Baffle; and remove Baffle and Filter Element from Shaft.

6. Wipe Bowl and internal parts clean.

7. Install new Filter Element on Shaft. While holding Filter in place, screw Baffle into place.

NOTE: Replacement Elements and parts are available through the Unit manufacturer or your local supplier.

8. Install Bowl Assembly with O-Ring on Unit. Rotate Bowl until Button on side of Bowl snaps into place, locking Bowl into Unit.

9. Connect In-Coming Factory airline at Quick-Disconnect.

10. Turn Red Safety Valve ON.

11. Close top access Cover to the Machine.

12. Turn ON power to the Machine at Master ON/OFF Switch, on Electrical Enclosure.

FILTER - HYDRAULIC (Optional)

Change filter on main hydraulic drive unit every six months, or sooner if required (see Figure 4-4):

HYDRAULIC RESERVOIR (Optional)

Change hydraulic fluid in reservoir once each year (refer to Figure 4-4).

CAUTION

Any hydraulic oil used for filling the hydraulic reservoir, or priming or filling pump and motor cases must be filtered with a 10 micron filter.

HYDRAULIC FLUID COOLER (Optional)

The hydraulic fluid heat exchanger located on top of power unit requires cleaning twice a year (refer to Figure 4-12).

CAUTION

If this is not done, overheating will result.

Blow air into the coils to clean.

NOTES

SECTION 5
TROUBLESHOOTING

GENERAL

This section contains Troubleshooting information in table form which should be used when problems occur with machine. The table lists problems encountered, possible causes, and solutions for problems along with reference to section of manual where detailed instructions may be found to correct problems.

OPERATIONAL TROUBLESHOOTING

For suggestions on correcting problems with bore conditions or with honing operation; consult Table 5-1.

TABLE 5-1, Operational Troubleshooting Index

PROBLEM	PROBABLE CAUSE	SOLUTIONS	SEC.	SCREEN
Tool generates high load	1. High feed rate	A. Lower feed rate	3	Run / Diagnostic
	2. Worn tool	A. Replace tool	2	Setup
	3. Tool Loading (Metal particles on tool surface)	A. Dress tool	3	
		B. Increase tool's rpm		
		C. Check coolant*	1	
Tool not cutting	1. Glazing	A. Dress tool	2	Setup
		B. Increase feed rate	3	Run / Diagnostic
		C. Increase stroking speed	3	Run / Diagnostic
		D. Replace tool, use softer grit tool	2	Setup
		E. Check coolant*	4	
Slow stock removal	1. Improper spindle speed	A. Increase spindle speed	3	Run / Diagnostic
	2. Inadequate tool feed rate	A. Increase feed rate	3	Run / Diagnostic
	3. Improper tool	A. Replace tool	2	Setup
	4. Inadequate tool's rpm	A. Increase tool's rpm	3	Run / Diagnostic
	5. Improper or diluted coolant*	A. Check coolant*	4	
Poor stone life	1. Excessive tool feed rate	A. Decrease feed rate	2-3	Run / Diagnostic
	2. Inadequate tool's rpm	A. Increase tool's rpm	3	Run / Diagnostic
	3. Improper tool	A. Replace tool	2	Setup
	4. Improper or dilute coolant*	A. Check coolant*	4	
	5. Excessive stock removal	A. Decrease stock removal	3	
	6. Excessive float in tool(s)	A. Decrease tool float	2	Setup
	7. Worn guide bushings	A. Replace bushings	4	
Bellmouth	1. Short or unbalanced part	A. Shorten stroke length	3	Run / Diagnostic
	2. Improper tool	A. Replace tool	2	Setup
	3. Improper stroke length	A. Shorten stroke length	3	Run / Diagnostic
	4. Excessive float in tool(s)	A. Decrease tool float	2	Setup
	5. Worn guide bushings	A. Replace bushings	4	
Barrel	1. Improper stroke length	A. Shorten stroke length	3	Run / Diagnostic
		B. Increase stroke length	3	Run / Diagnostic
		C. Replace tool	2	Setup
	2. Improper tool	A. Replace tool	2	Setup

*NOTE: Many honing problems, such as poor tool life and rough finish, are caused by the following: the wrong coolant, insufficient coolant, dirty coolant, or contaminated coolant. Use ONLY clean, full-strength Sunnen Industrial Honing Oils or Water-Based Coolants. DO NOT dilute or "cut" the oil or coolant in your Machine with other oils or coolants. Keep solvents and cleaning fluids away from your Machine.

TABLE 5-1, Operational Troubleshooting Index (cont'd)

PROBLEM	PROBABLE CAUSE	SOLUTIONS	SEC.	SCREEN
Taper in Open Hole	1. Improper overstroke	A. Lengthen overstroke on tight end	3	Run / Diagnostic
	2. Workpiece and Spindle not aligned	A. Align Workpiece and Spindle	3	Run / Diagnostic
	3. Part/tool geometry	A. Readjust stroke position	3	
Taper in Blind Hole	1. Improper stroke length	A. Increase stroke length	3	
	2. Inadequate relief in blind end	A. Provide sufficient relief		
		B. Short stroke tight end	3	Run / Diagnostic
		C. Replace tool	2	Setup
	3. Inadequate oil flow	A. Adjust Oil Nozzle		
Out-Of-Round	1. Undersize honing tool	A. Replace tool	2	Setup
	2. Workpiece flexing (thinwall)	A. Decrease feed rate	3	Run / Diagnostic
		B. Change method of fixturing	2	
		C. Decrease spindle speed	3	Run / Diagnostic
		D. Reduce stock removal		
	3. Improper tool	A. Replace tool	2	Setup
	4. Excessive float in tool(s)	A. Decrease tool float	2	Setup
	5. Fixture not properly Aligned	A. Adjust Fixture	2	Setup
Waviness	1. Improper tool length	A. Use tool with sufficient stone length to bridge waviness in bore	2	Setup
Rainbow	1. Improper tool length	A. Replace tool (tool length should be 1-1/2 times bore length)	2	Setup
	2. Improper overstroke	A. Shorten overstroke	3	Run / Diagnostic
	3. Improper tool	A. Replace tool	2	Setup
Rough Finish	1. Improper feed rate	A. Decrease feed rate	3	Run / Diagnostic
	2. Improper tool	A. Replace tool	2	Setup
	3. Material loading tool	A. Inspect & clean		
	4. Improper or diluted coolant*	A. Check coolant*	4	
Scratches in Bore (Random)	1. Improper feed rate	A. Decrease feed rate	3	Run / Diagnostic
	2. Improper tool	A. Replace tool	2	Setup
	3. Improper or diluted coolant*	A. Check coolant*	4	

*NOTE: Many honing problems, such as poor tool life and rough finish, are caused by the following: the wrong coolant, insufficient coolant, dirty coolant, or contaminated coolant. Use ONLY clean, full-strength Sunnen Industrial Honing Oils or Water-Based Coolants. DO NOT dilute or "cut" the oil or coolant in your Machine with other oils or coolants. Keep solvents and cleaning fluids away from your Machine.

MACHINE OPERATION TROUBLESHOOTING

Error Messages:

The SV Series Machines have built in error messages that will appear on display screen to alert operator when machine has stopped due to an error, problem, or incorrect setup.

Problems / Solutions:

WARNING

Some troubleshooting procedures require examining parts inside machine enclosure. ALWAYS have power OFF when guards are open. If problem cannot be diagnosed by Power Off inspection, then consult a Sunnen Service Technician.

PROBLEM: Control system gives a message indicating that the grease system is out of grease, but grease can still be seen in the reservoir.

SOLUTIONS:

- An air pocket in the grease system can cause this fault. Use the following procedure to bleed the air from the system:

1. Disconnect all grease lines from their grease injectors.

2. Remove all the grease injectors from the manifold.

3. In the Diagnostics section of the control software, set the grease system to cycle 100 times.

4. Watch the open ports in the manifold. As soon as grease comes out an open port, then install that injector in the open port.

NOTE: If you cannot hear the grease pump cycling, then either the pump is defective or there is a loose electrical connection.

5. When all injectors are installed begin looking for grease to come out of the injectors. As soon as grease can be seen coming out of an injector then connect a grease line to that injector.

6. After all grease lines have been reconnected, allow the system to finishing the 100 cycles. If no faults occur in those 100 cycles then the air has been successfully bled out of the system.

PROBLEM: Routine inspection of lubrication system shows that grease is not coming out of one or more grease lines.

SOLUTIONS:

- Remove the grease lines from the tops of the grease injectors. Under the Diagnostics section of the software, set the lube system to cycle 50 times.

1. If grease is seen coming out of the injectors, then the problem is with the grease line. It is either clogged or has a leak. In either case it should be replaced.

2. If grease is not seen coming out of one or more injector, then remove the injector(s) from the manifold. Is grease coming out of the manifold port(s) as the system continues to cycle? If not then proceed to step 5.

3. If grease is coming out of the port(s) then reinstall the injector(s). Only reinstall an injector into a port where grease is present. If air is trapped below the injector it will not work properly.

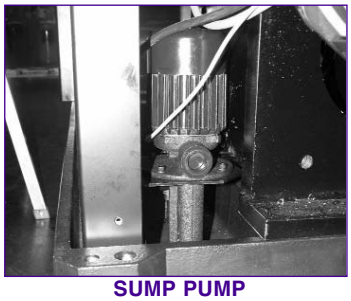
4. If grease does not come out of the reinstalled injector, then the injector is not working properly. An injector may be disassembled and cleaned to get it to resume working, if that does not work then the injector is defective and should be replaced.

5. If grease is not seen coming out of the port(s) when the injectors are removed then air must be bled from the grease pump. Open the air bleed port just below the grease reservoir and continue cycling the system until grease can be seen coming out of the port. If this does not happen then the pump is defective.

6. After taking the necessary corrective action and reassembling, but before reattaching the grease lines to the ball screw and ball spline, cycle the lube system 50 times and verify that grease is coming out of the lines.

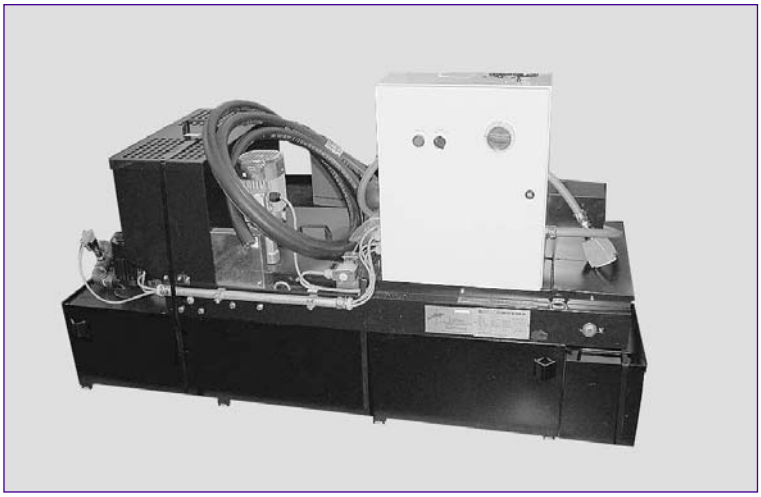
NOTES

A - COOLANT SYSTEM (OPT)
FLOW DIAGRAM



SUMP PUMP

OPTIONAL
COOLANT SYSTEM



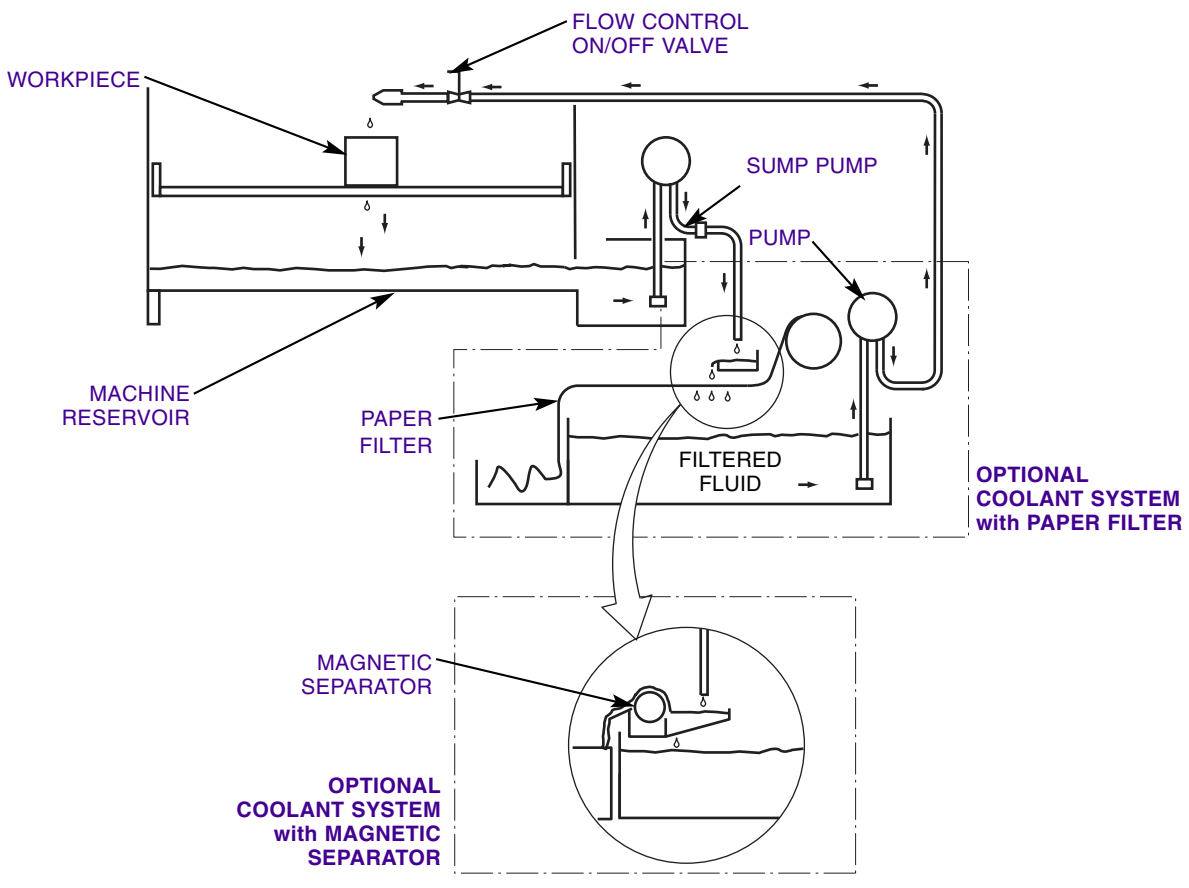
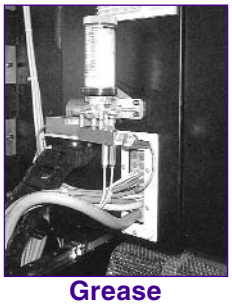


FIGURE A-1, Coolant System Flow Diagram

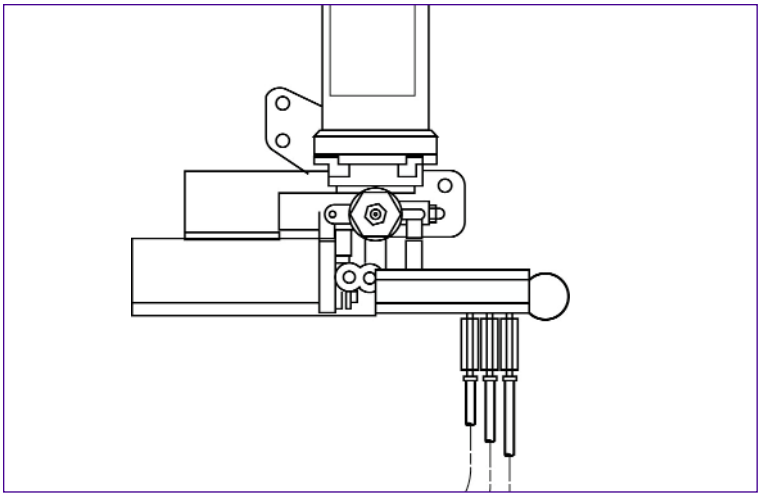
NOTES

B - GREASE LUBRICATING SYSTEM FLOW DIAGRAM



Grease Lubricating System

Grease Lubricating System



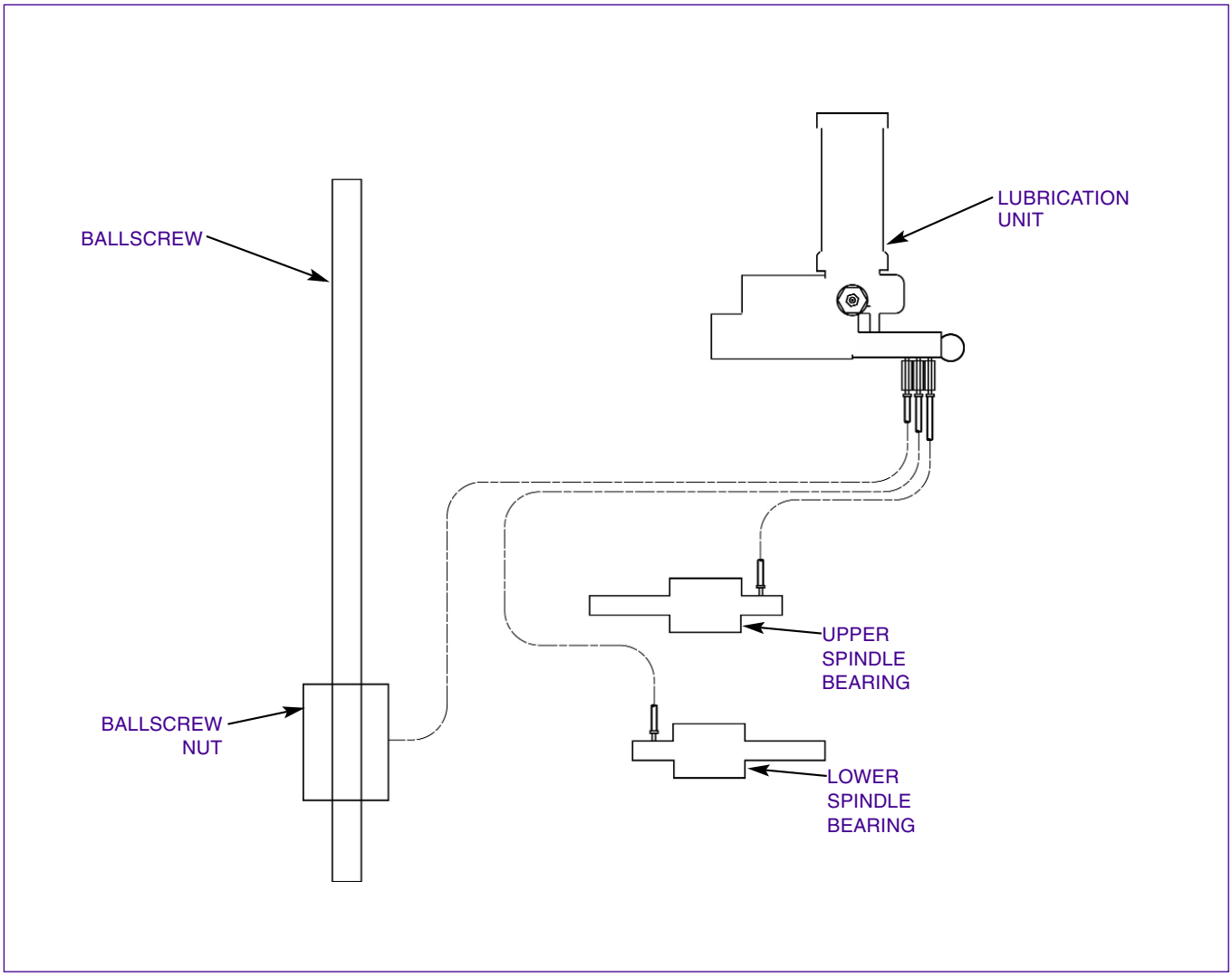


FIGURE B-1, Grease Lubricating System Flow Diagram

NOTES

Like any machinery, this equipment may be dangerous if used improperly. Be sure to read and follow instructions for operation of equipment.

FRACTION / DECIMAL / MILLIMETER EQUIVALENTS CHART

INCH FRACTION	INCH DECIMAL	MILLIMETER	INCH FRACTION	INCH DECIMAL	MILLIMETER	INCH FRACTION	INCH DECIMAL	MILLIMETER
. . . .	.003937	0,1000	9/32	.281250	7,1438	21/32	.656250	16,6688
. . . .	.007874	0,2000	19/64	.296875	7,5406	. . . .	.669291	17,0000
. . . .	.011811	0,3000	5/16	.312500	7,9375	43/64	.671875	17,0656
1/64	.015625	0,3969	. . . .	.314961	8,0000	11/16	.687500	17,4625
. . . .	.015748	0,4000	21/64	.328125	8,3344	45/64	.703125	17,8594
. . . .	.019685	0,5000	11/32	.343750	8,7313	. . . .	.708661	18,0000
. . . .	.023622	0,6000	. . . .	.354331	9,0000	23/32	.718750	18,2563
. . . .	.027559	0,7000	23/64	.359375	9,1281	47/64	.734375	18,6531
1/32	.031250	0,7938	3/8	.375000	9,5250	. . . .	.748031	19,0000
. . . .	.031496	0,8000	25/64	.390625	9,9219	3/4	.750000	19,0500
. . . .	.035433	0,9000	. . . .	.393701	10,0000	49/64	.765625	19,4469
. . . .	.039370	1,0000	13/32	.406250	10,3188	25/32	.781250	19,8438
3/64	.046875	1,1906	27/64	.421875	10,7156	. . . .	.787402	20,0000
1/16	.062500	1,5875	. . . .	.433071	11,0000	51/64	.796875	20,2406
5/64	.078125	1,9844	7/16	.437500	11,1125	13/16	.812500	20,6375
. . . .	.078740	2,0000	29/64	.453125	11,5094	. . . .	.826772	21,0000
3/32	.093750	2,3813	15/32	.468750	11,9063	53/64	.828125	21,0344
7/64	.109375	2,7781	. . . .	.472441	12,0000	27/32	.843750	21,4313
. . . .	.118110	3,0000	31/64	.484375	12,3031	55/64	.859375	21,8281
1/8	.125000	3,1750	1/2	.500000	12,7000	. . . .	.866142	22,0000
9/64	.140625	3,5719	. . . .	.511811	13,0000	7/8	.875000	22,2250
5/32	.156250	3,9688	33/64	.515625	13,0969	57/64	.890625	22,6219
. . . .	.157480	4,0000	17/32	.531250	13,4938	. . . .	.905512	23,0000
11/64	.171875	4,3656	35/64	.546875	13,8906	29/32	.906250	23,0188
3/16	.187500	4,7625	. . . .	.551181	14,0000	59/64	.921875	23,4156
. . . .	.196850	5,0000	9/16	.562500	14,2875	15/16	.937500	23,8125
13/64	.203125	5,1594	37/64	.578125	14,6844	. . . .	.944882	24,0000
7/32	.218750	5,5563	. . . .	.590551	15,0000	61/64	.953125	24,2094
15/64	.234375	5,9531	19/32	.593750	15,0813	31/32	.968750	24,6063
. . . .	.236220	6,0000	39/64	.609375	15,4781	. . . .	.984252	25,0000
1/4	.250000	6,3500	5/8	.625000	15,8750	63/64	.984375	25,0031
17/64	.265625	6,7469	. . . .	.629921	16,0000	1	1.000000	25,4000
. . . .	.275591	7,0000	41/64	.640625	16,2719	1-1/16	1.062500	26,9880

FORMULAS:

MULTIPLY		BY		TO GET
INCHES (in)	x	25.4	=	MILLIMETERS (mm)
FEET (ft)	x	0.3048	=	METERS (m)

MULTIPLY		BY		TO GET
MILLIMETERS (mm)	x	0.03937	=	INCHES (in)
METERS (m)	x	3.281	=	FEET (ft)

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